Abscess within a Glioblastoma Multiforme
—Case Report—

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Abstract

A rare case of abscess within a glioblastoma with an unusual presentation occurred in a 46-year-old female who developed right hemiparesis and seizure. Computed tomography and magnetic resonance imaging demonstrated hemorrhage which mimicked hemorrhagic infarction. However, the lesions developed ring enhancement. Aspiration showed one to be an abscess, which collapsed by drainage but later re-expanded. The mass was removed, and histological examination revealed glioblastoma.

Key words: abscess, intratumoral abscess, glioblastoma multiforme, multicentric glioma, Staphylococcus aureus

Introduction

Abscess formation within a brain tumor is uncommon, usually occurring within a pituitary tumor after direct extension. We report a case of metastatic abscess in a glioblastoma presenting with an unusual clinical course.

Case Report

A 46-year-old female presented with transient dysesthesia of her left upper extremity on August 7, 1989. On admission, she had no neurological deficit. Computed tomographic (CT) scans revealed low-density areas in both the right frontotemporal area and left frontal lobe resembling multiple infarction (Fig. 1A). T2-weighted magnetic resonance (MR) images also demonstrated high-signal intensity in both areas (Fig. 1C). The lesions were ill-defined on T1-weighted images (Fig. 1B). Cerebral angiograms showed no stenotic lesion or abnormal vessels. She received antiplatelet therapy.

After discharge, she was asymptomatic until her right upper extremity became unresponsive on September 22, 1989. Deterioration of the unresponsiveness and subsequent seizure developed 7 days later. On the 2nd admission, neurological examination showed that she was alert with right hemiparesis and mild aphasia. No infectious sign, such as fever, leukocytosis, or increased C-reactive protein (CRP) level, was found. CT scans demonstrated a high-density area of hematoma associated with widespread edema in the left frontal lobe (Fig. 2A). T2-weighted MR images clearly demonstrated the hemorrhagic lesion (Fig. 2C). Subsequent CT scans revealed a small hyperdense lesion in the right frontal lobe on the 10th hospital day (Fig. 2B). Both lesions were suspected to be hemorrhagic infarction or intratumoral hemorrhage. Symptoms of increased intracranial pressure were mild, so she received conservative treatment.

On the 11th hospital day, high fever began to develop and her consciousness became cloudy. Severe leukocytosis (white blood cell count, 18,700/μl) with increased CRP level developed. Systemic examination revealed thrombophlebitis in her right femur and suspected sepsis. Phlebitis improved with antibiotic therapy and the fever subsided gradually.

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but the CRP level remained high. CT scans demonstrated a gradual change in both hematomas to ring-enhanced cystic masses suggesting abscess formation (Fig. 3A). Aspiration of the left cystic mass on the 33rd hospital day revealed abscess. Pus culture identified *Staphylococcus aureus* and antibiotics were administered systemically. CT scans demonstrated gradual diminution of the abscess after drainage (Fig. 3B) and the hematological examination showed a return to normal values. Both right hemiparesis and aphasia improved. Serial CT scans, however, showed that the left frontal cystic mass had re-expanded irregularly and aggravated the midline shift (Fig. 3C). Her consciousness level, right hemiparesis, and aphasia deteriorated progressively despite the negative CRP, normal hemogram, and afebrile state.

On March 1, 1990, the mass was subtotally removed. The mass included a few abnormal vessels, was partially hard and well-circumscribed like a granuloma, but infiltration obscured the border with
the brain. Histological examination of the tumor specimen revealed glioblastoma (Fig. 4).

Subsequent radiation therapy did not continue the postoperative improvement and her condition worsened. She died on October 27, 1990. Autopsy was not permitted.

Discussion

We first diagnosed this case as brain abscess based on the aspirated pus from the cystic lesion and the presence of *Staphylococcus aureus*. The multiplicity of the lesions was also compatible with the diagnosis. The hidden glioma, however, was detected by the continuous enlargement in lesion size after drainage and increased irregularity of the cyst wall, despite the undetectable CRP, normal white blood cell count, and absence of fever.

There are few reported cases of abscess within a brain tumor, most within pituitary tumors. Obrador and Blazquez reported an abscess within a craniopharyngioma and reviewed five previous intratumoral abscesses in the pituitary region. Three cases had developed within pituitary adenoma and three within craniopharyngioma. In four patients, the signs and symptoms of meningeal irritation were first. Three patients showed clear evidence of sinus infection, suggesting that such an abscess may develop due to direct extension of adjacent sinus infections.

There are few reported cases of abscess within an intra-axial tumor such as glioma. Noguerado et al. reported an abscess within a glioblastoma multiforme. Long-term steroid therapy and the immunosuppressive effect of glioblastoma had probably participated in the etiology of the abscess. Rodriguez et al. also reported an abscess within a brain metastasis from an embryonal carcinoma with testicular seminoma, but did not comment on the cause of the abscess. In both cases, the causative pathogen was *Salmonella enteritidis* metastasized via the blood.

Abscess formation is frequently associated with cerebrovascular disease such as intracerebral hematoma and cerebral infarction. Disruption of blood-brain barrier by ischemia or edema and, in hemorrhagic infarction or intracerebral hematoma,
levels, which may increase in glioma, were extremely elevated in seven of nine abscesses, although within the normal range in the other two.

No confirmation was possible for the lesion on the opposite side, because autopsy was refused. However, this also increased in size gradually after the 2nd admission, so may have been a glioma. In cases of multiple cerebral lesions like ours, the most common causes of multiple ring-enhanced areas are metastatic tumors or multiple abscesses. Glioblastoma can induce multiple cerebral lesions, and multicentric glioma is not so rare. Batzdorf and Malamud\(^5\) reported an incidence of about 2.4% and other reports vary from 1 to 10%. Barnard and Geddes\(^6\) made a histological study of large hemispheric sections of a series of 241 gliomas, finding the incidence of multicentric gliomas was 7.5%, similar to the incidence of multiple abscess of about 4%.\(^1\) However, multicentric glioma is often overlooked as a cause of multiple intracranial lesions. Moreover, differential diagnosis from metastatic tumor or multiple abscesses is occasionally difficult based only on CT.\(^2\) Chadduck et al.\(^3\) emphasized that the multicentric gliomas are a cause of multiple cerebral masses, requiring prompt biopsy.

In this case, the initial appearance was infarctions followed by hemorrhagic infarctions, but multiple lesions developed and an abscess occurred within the intratumoral hematoma, all confusing the early diagnosis. CT and MR diagnostic imaging methods are improving, but troublesome cases still occur. A combination of imaging information with general condition, laboratory data and, in some cases, biopsy is needed.

**References**

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Fig. 4 upper: Photomicrograph of tumor specimen, showing abundant mitosis and pleomorphism, with increased cellularity and endothelial proliferation. Some giant cells are present. Pseudopalisading was abortive. HE stain, ×200. lower: Photomicrograph of the apparent capsule, showing mild infiltration of inflammatory cells in the connective tissue. HE stain, ×100.

the hematoma acting as a culture medium are important in the development of metastatic abscess.\(^6\)\(^7\) An analogous mechanism was suspected in our case. In addition to the steroid therapy against the brain edema, the glioblastoma which has no blood-brain barrier and the nutritious hematoma within the tumor may have induced the metastatic abscess by sepsis following phlebitis.

Two lesions were present in this case, and both demonstrated ring enhancement on postcontrast CT scans. The lesion in the left frontal lobe first appeared like an abscess, then as a glioblastoma which was finally confirmed by histological examination. Both glioblastoma and metastatic tumor sometimes mimic a brain abscess on CT scans, confusing the clinical diagnosis. Hirschberg and Bosnes\(^5\) suggested that CRP is an indicator for differential diagnosis of brain abscess from malignant glioma in patients with a ring-enhanced cystic lesion on CT scans. CRP


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